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Performing an aseptic technique in a community setting: fact or fiction?

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Background: Maintaining the principles of asepsis when performing wound care and other invasive procedures is one of the fundamental approaches of preventing healthcare-acquired infection. Such an approach has been advocated for community practitioners. **Literature:** The performance of an aseptic technique is an under-researched area. The few studies that have been conducted have identified how strict adherence to the technique is difficult and contamination of hands/gloves is common and that community nurses often have a fatalistic view about whether asepsis is possible in a community setting. **Aim:** The overall aim of this research project was to examine how experienced practitioners have adapted the aseptic technique within a community setting and to what extent the changed procedure still adhered to the principles of asepsis. **Methods:** This study used a mixture of non-participant observation and individual semi-structured interviews to examine adherence to the principles of the aseptic technique among the district nurses. Data were collected from one Trust in England with a total of 10 district nurses taking part and 30 aseptic procedures been observed. **Results:** The results show that almost all of the staff understood the principles of asepsis and had adapted the standard procedure for use in a patient's home. Common challenges included wound cleaning using a single nurse procedure, the contents of the pack and the home environment. The research also identified misconceptions about clean versus aseptic procedures and a lack of training for staff. **Conclusions:** This study highlights the challenges of maintaining the principles of asepsis in a home environment and the fact that district nurses are often relied upon to find creative solutions to such challenges. The study also highlights issues around the implementation of evidence-based practice and the need for clearer guidance about how evidence should be used alongside existing procedures.

Key words: aseptic technique; challenges; community nursing; implementation of evidence; solutions

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Background

Over the past 10 years infection prevention and control have had an exceptionally high profile, largely because of public concerns about methicillin-resistant *Staphylococcus aureus*, *Clostridium*

difficile and the cleanliness of healthcare premises. While the media spotlight has been on in-patient services community, health services are being increasingly targeted because of concerns about community-associated infections (Abudu *et al.*, 2001). More recently, the Department of Health in the UK has highlighted how a focus on the fundamental principles of infection prevention and control can reduce healthcare-associated infection (Department of Health, 2003; 2005). Maintaining the principles of asepsis, when performing

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wound care and other invasive procedures, is one of the fundamental approaches to preventing healthcare-associated infections. Such an approach has been advocated for community practitioners (Department of Health, 2007).

Infection control teams within primary care trusts (PCTs) are been asked to ensure that the principles of asepsis are adhered to. However, it is difficult for such teams to teach staff how to perform an aseptic technique in a community setting because of a dearth of evidence about how the problems of the environment, having no dressings trolley, limited access to single-use sterile items, etc. can be overcome.

The aim of the aseptic technique is to prevent the transmission of microorganisms to wounds and other susceptible sites, thereby reducing the risk of infection (Preston, 2005). Despite this aim, there is evidence that the practitioners experience problems when performing aseptic procedures (Ward, 2000; Michalopoulos and Sparos, 2003).

This research aimed to explore how far it was possible for community nurses to maintain the principles of asepsis in a home setting when performing invasive procedures and wound care. The study specifically examined those parts of the aseptic technique that are problematic and the methods experienced community practitioners used to 'work around' problems.

This study is particularly timely given the focus on asepsis as part of the Code of Practice for the prevention and control of healthcare associated infection (Department of Health, 2008). The Code of Practice (Department of Health, 2008) stipulates the following in relation to aseptic technique:

- Clinical procedures should be carried out in a manner that maintains and promotes the principles of asepsis
- Education, training and assessment in the aseptic technique should be provided to all persons undertaking such procedures
- The technique should be standardised across the organisation
- Audit should be undertaken to monitor staff compliance with the aseptic technique.

Most of the research into the aseptic technique has been conducted in a hospital setting and its transferability to a community care setting is severely limited (Hallett, 2000). The problems presented by transferability of evidence seriously

undermine the ability of PCTs to meet the requirements of the Health Code of Practice (Department of Health, 2008).

Research questions

The overall aim of this research project was to examine how experienced practitioners have adapted the aseptic technique within a community setting and to what extent the changed procedure still adheres to the principles of asepsis.

The study sought to answer the following research questions:

- 1) Do community nurses adhere to the principles of asepsis when performing wound care and invasive procedures, for example, catheterisation?
- 2) Which areas of the aseptic technique are problematic in a community setting and what approaches have practitioners adopted to ensure that the principles of asepsis are adhered to?

Literature review

Hart (2007) describes how the aseptic technique is traditionally divided into two different processes; surgical aseptic technique and aseptic non-touch technique (ANTT). The surgical aseptic technique is used mainly in operating theatres although it is also appropriate for certain procedures carried out in critical care environments. Pratt *et al.* (2007) define ANTT as 'a method used to prevent contamination of susceptible sites by microorganisms that could cause infection, achieved by ensuring that only sterile equipment and fluids are used and the parts of the components that should remain sterile, are not touched or allowed to come into contact with non sterile surfaces'. The technique involves standardisation of procedures, effective hand decontamination and ensuring that when handling equipment only the part of the equipment that is not in contact with the susceptible site is touched (Hart, 2007; Rowley and Clare, 2009).

Of the few studies that have been conducted many concentrate on the performance of the aseptic technique in a ward, or the departmental area of practice. One such study was the observational research conducted by Bree-Williams and Waterman (1996), which found that 33% of

nurses performing an aseptic procedure were found to have contaminated their hands and equipment during the process. Bree-Williams and Waterman (1996) felt that this contamination occurred for a number of reasons including the fact that staff often made the process much more complicated than it needed to be, failure to adhere to a good hand washing technique and poor technique when handling equipment and dressings with forceps. Despite these studies, the procedure remained largely unchanged until the turn of the millennium when ANTT emerged as a standardised procedure. ANTT is now the Department of Health (2008) and epic2 (Pratt *et al.*, 2007) endorsed best practice process for the aseptic technique (Aziz, 2009).

Hallett (2000) conducted one of the only studies that specifically examined the aseptic technique within a community setting. This small-scale study used interviews with community nurses to explore their perceptions of the aseptic technique in wound care. In her study, she found that community nurses had a fatalistic view that the aseptic technique was virtually impossible to perform correctly within a community setting. Hallett (2000) also found that many staff were confused about the principles of asepsis and had difficulty in describing the elements of the procedures.

Preston (2005) describes that one of the problems with trying to improve compliance with the aseptic technique is that practitioners are often confused by the notion of the aseptic technique and a clean technique. Gilmore (2000) describes how a clean technique has the same aim as an aseptic technique but uses clean gloves rather than sterile gloves. A clean technique was introduced following research to explore the cleansing of wounds using tap rather than sterile water (Boxer and Maynard, 1999). Most of the studies examining the use of tap water to clean wounds have concluded that high-quality (drinkable) tap water is likely to be as effective as sterile saline in wound cleansing (Fernandez and Griffiths, 2008). The preferred method of wound cleansing, irrespective of the solution used, is irrigation rather than swabbing as swabbing may damage the fragile granulation tissue (Joanna Briggs Institute, 2008).

The suggested fatalistic outlook of community nurses (Hallett, 2000) together with a lack of understanding about the elements of the aseptic technique is of concern given the increasing focus

on developing out-of-hospital care, which is resulting in community nursing staff caring for patients who are increasingly ill, have complex needs and require more invasive interventions (Ward, 2000).

It appears that over time nurses have been convinced that the aseptic technique, particularly for chronic wounds is not a significant requirement. As highlighted earlier this may in part be due to confusion between a 'clean' and an aseptic technique. In addition, the widespread use of tap water for the cleansing of chronic wounds (Fernandez and Griffiths, 2008; Moore and Cowman, 2009), which was introduced in 1990s may also have played a part in the confusion surrounding the aseptic technique in a community setting.

Research methods

This study used a constructivist methodology (Lincoln, 1990). Within a constructivist methodology reality is viewed as a social construction that is formulated by the individual experiencing a particular phenomenon (Lincoln and Guba, 1985). With this in mind there can be multiple constructions of the same phenomena and indeed the researcher also constructs a reality while undertaking the research. This methodology was selected as the basis for this study, as the researchers are interested in exploring how qualified community practitioners perceive and have adapted the aseptic technique procedure for a community setting. One of the key features of constructivist enquiry is that the study of the phenomena must be context-bound and, therefore, it is necessary to study the phenomena within the practice setting in which it occurs. Constructivist inquiry is iterative in nature with several forms of data collection, analysis, critique and further exploration of the data until the phenomenon being studied has been jointly constructed by the participants and the researcher (Guba and Lincoln, 1989). This research study combined individual interviews with experienced community practitioners with non-participant observation of practice.

Observation

Observation in qualitative research is fundamentally naturalistic in nature (Adler and Adler, 1998). Observation was used in this study to

identify how the aseptic technique was adapted by community nurses working in a community setting. Although a structured observational tool was developed based on the procedure outlined in the Royal Marsden Manual of Policies and Procedures (Dougherty and Lister, 2008), the purpose of observation in this study was not to audit the technique but to identify how the technique had been adapted. Once a variation from the procedure was noted a field note was created to describe the extent and the nature of the variation. Each of the noted variations was then discussed in detail in the subsequent semi-structured interviews with the nurses. A series of aseptic procedures performed on a total of 30 separate patients were observed. It was envisaged that the majority of the observations would involve wound care, as this is the most common aseptic procedure performed. However, other procedures, such as catheterisation and cannulation, might have been observed if there were patients who required this care during the duration of the study.

Individual semi-structured interviews

A series of 10 individual semi-structured interviews were conducted with experienced community practitioners. Within the semi-structured interviews the researcher asks certain major questions but is free to alter the sequencing of questions and to probe for more information (Fielding, 1994). This method allows the researcher to talk around a topic thus exploring more dimensions of the phenomenon being studied than would otherwise be possible. The semi-structured interviews were used to explore the practitioner's perceptions of the aseptic technique within a community setting. The interview was split into two components. The first part of the interview looked at the nurses' understanding of the elements of an aseptic technique, how these elements could be adhered to in a community setting and what the nurse perceived as the problems of performing an aseptic technique within a patient's home. The first part of the interview concluded with questions about what training the nurse had received in relation to the aseptic technique. The second component of the interview explored in detail what had been observed during the delivery of care. In this component, the field notes recorded as part of the observation were used as the basis of the discus-

sion regarding how the nurse had adapted the procedure.

Semi-structured interviews were selected over methods such as focus groups as it was anticipated that they would allow practitioners to talk about their practice without a concern that they would be adversely judged by their peer group.

Sample

The study had two sampling approaches. First, convenience sampling was used to select the district nurse participants. A total of 10 district nurses were recruited, all of whom have held their specialist practitioner qualification in district nursing for a minimum of two years. The nurses were drawn from two localities of a single North East, Primary Care Trust. Second, each of the district nursing participants was asked to identify patients who they were visiting and who required aseptic procedures. The researchers identified that the following procedures may be performed in a community setting:

- Wound care related to either chronic, acute or surgical wounds
- Catheterisation
- Intravenous drug administration and care of central venous catheters
- Peripheral cannulation.

Once the district nurse participants had selected appropriate patients then purposive sampling was used to try and ensure coverage of a variety of procedures. Crooks and Davis (1998) define purposive sampling as 'judgemental sampling that involves the conscious selection by the researcher of certain subjects or elements to include in the study'. The care delivered to 30 separate patients was observed (three observations for each of the district nurse participants). Following this the 10 district nurse participants were interviewed.

Although a range of wound care and two catheterisation procedures were observed, it was not possible to observe a full range of aseptic procedures. Many procedures such as catheterisation are carried out on an urgent basis and it was impracticable for the researchers to be 'on call' in order to collect data. In addition, such data collection could be regarded as unethical as consent would have been sought from a patient who was distressed and in pain at the time of the

procedure. Intravenous drug administration occurs less commonly in a community setting and such care procedures are often time limited. Despite data collection over a six-month period no patients with a central venous catheter were receiving care from the sampled teams and therefore no data were collected in relation to the performance of these procedures.

Ethical issues

This research involved data collection from both National Health Service (NHS) staff and indirectly from patients via non-participant observation of their care delivery. The study gained approval from National Research Ethics Service via a local research ethics committee (LREC) and via NHS Research Governance frameworks.

The key ethical issue raised by this research study was the potential observation of intimate care. This was of particular concern in relation to catheterisation. The research team argued, successfully, that catheterisation in a community setting presented a number of unique challenges, which other aseptic procedures did not. This, together with the assurances that the patient would be offered a researcher of the same gender as him/herself, reassured the LREC sufficiently for approval to be given.

Data analysis

Observation data were collected using both a structured collection tool and field notes to record parts of the procedure they observed outside of the standard principles of the aseptic technique. These data were used to explore how practitioners adapted the procedure for a community setting during the individual semi-structured interviews. The standard observation data were analysed to reveal compliance with and potential adaptations to the procedure. However, it was not intended that the observation data be used to collect statistical data about the degree of compliance but rather to ascertain which parts of the standard procedure were problematic when performed in a community setting.

Interview recordings were transcribed verbatim and subjected to qualitative data analysis using the eight steps to analysis of qualitative data described by Tesch (1990). This resulted in the

progressive identification of codes, categories and themes related to the perceptions of practitioners regarding the performance of an aseptic procedure within a community setting. It was envisaged that the data would provide insight into how practitioners have adapted the procedure to ensure adherence to the principles of the aseptic technique.

Results

The observations, together with the semi-structured interviews, revealed that while the district nurses in this study attempted to maintain asepsis during procedures, a number of factors mitigated against this. There was no evidence that the district nurses in this study had a fatalistic view of the performance of the aseptic technique in a community setting. However, the participants were all aware of the challenges that the performance of the procedure in a community setting brought.

I think you just have to adapt your practice to suit the environment. I've worked in the community a lot of years obviously I've seen lots of different homes, some are immaculately clean and others less so you've just got to adapt.

Without exception all of the participants had initially being taught the aseptic technique during their nurse training. The majority of the nurses ($n = 9$) trained at a time when the assessment of competence in practice formed part of the nursing syllabus (Takahashi, 2002) and the participants were aged between 33 and 58 years (median age 44.8 years). Some participants underwent initial aseptic technique training 20 or more years ago (median – 26 years with a range from 12 to 34 years) and many participants commented how the procedure packs and guidance had changed several times over the past few years.

What I find particularly difficult about aseptic technique is the changes, they constantly change the packs and what they have in them. This makes it more difficult as there is less choice about how you work with them (the packs) to perform the procedure.

Despite the changes, the participants were able to refer to the principles of asepsis and many directly mentioned the use of the aseptic non-touch

technique. The principles of asepsis, as taught during initial nurse education, were ingrained.

I think when something is ingrained into you from such an early stage you do try to keep to it and it is much easier when you have got a procedure in your mind – even through you do have to adapt it slightly you can keep to the principles.

The participants were able to identify important principles related to reducing bacterial contamination and transfer. All of the participants mentioned the importance of hand hygiene and personal protective equipment in maintaining asepsis. A number of participants ($n = 5$) referred to the passage of items from the sterile field of the wound and how a one-way flow should be maintained, although many acknowledged that this is not always possible when a nurse is working alone performing the procedure.

Obviously having a sterile field is important and that everything you use within that is sterile and promoting a clean environment to the patient.... It's also about hand hygiene at the beginning, and a good technique such as putting gloves on and other protective equipment like an apron to reduce contamination and cross infection.

Some practitioners ($n = 3$) recounted how, when they had initially been shown how to use the aseptic technique, they had been taught how to use the forceps to handle materials and pass dressings and swabs between the sterile field and the patient. None of the practitioners had been trained in the aseptic technique since their initial nurse training and most had simply adapted the procedure themselves once they had started working in a community setting. Some practitioners had a lack of awareness about developments in hospital-based practice, which make a lone nurse technique more commonplace than it was in the past (Hart, 2007).

I think aseptic technique is possible in the community but there are certain, like, adaptations that you have to do, you have to use your imagination a bit whereas in hospital you've just got an extra nurse there to help.

The potential for each nurse developing their own individual procedure raises concerns about ritualistic practice, which has little or no bearing

on the maintenance of the principles of asepsis. This is one of the reasons why research into how the procedure is performed in a community setting is important as it can highlight potentially unsafe and non-evidence-based practice. In addition to potential adaptations for a community setting, some ($n = 5$) practitioners highlighted how they would need to adapt the procedure to the patient's preferences and the environment.

I think probably you try to assess it very much on the first visit but often it can take two or three visits to realise perhaps which is the best process or system to employ.

A total of 30 aseptic procedures were observed. The vast majority of these (94%) was wound dressings to either chronic wounds ($n = 8$), leg ulcers ($n = 11$) or acute post-surgical wounds ($n = 9$). Only one other type of aseptic procedure was observed (6%). This was the replacement of a long-term urethral catheter ($n = 2$). On the whole there were attempts by staff to adhere to the principles of asepsis during the performance of the procedures. Common problems observed included contamination of the sterile field by non-sterile items, such as an irrigation pod ($n = 21$ procedures). A number of staff ($n = 16$) maintained the one-way flow of materials towards the wound with the passage of swabs, dressings, etc. from the 'clean' to the 'dirty' hand. However, maintaining the system throughout the procedures often proved difficult for a nurse who was working alone.

The quality of the materials within the dressing packs available via the Trust's wound care formulary was a constant cause for concern. These packs meant it was not possible for the participants to use a no-touch technique because the packs did not have forceps. The packs also had a single size of sterile gloves making it difficult for teams to deliver care. Despite the restrictions imposed by the dressing packs, many staff attempted to reduce bacterial transference by passing dressings/swabs between a 'clean' and a 'dirty' hand. However, this and wound irrigation (using a non-sterile saline pod) caused potential contamination of the sterile field and sterile gloves. Some interesting 'work arounds' were noted including picking the sterile saline pod up by using a swab or the sterile piece of paper in the pack. Another significant problem with the pack was the fact that the apron was inside the sterile field. As a result, the practitioner was required to

open the entire pack before they were in a position to apply the apron. This is impractical as the purpose of the apron is to reduce bacterial shed from and contamination of the uniform. A number of practitioners ($n = 4$) identified this as an issue in maintaining the principles of asepsis.

I would like the plastic apron as you open the outer wrapping of the pack so you could put it on before opening the sterile field ... instead you've got to open the whole pack before you get your apron on.

Some of the practitioners ($n = 3$) felt that the packs actually forced them to break the aseptic technique procedure. The lack of choice of dressing packs enforced through local prescribing formularies meant that the staff had to use what they considered to be sub-standard materials to perform the procedure.

if we actually had packs to accommodate the procedure you wouldn't have to break your technique in between but because of what we have in the packs and by encouraging us to use them we are being encouraged to break the cycle.

Finally, the fact that the packs contained sterile gloves presented problems where care was provided by teams of staff. Often staff with different-sized hands had to compromise at a particular size so that dressing packs could be ordered for the patient. The dexterity of nurses wearing oversized gloves when handling dressings can have a serious impact on maintaining asepsis.

I much preferred it when we had separate dressing packs and gloves as you had a choice ... I think the sizes present a problem when you're in a huge team you have to look at what's best for the majority of your team.

While the compromise over gloves overcame the problem for the usual district nurses attending the patient, at weekend problems still arose.

On a weekend if you're going to other people's patients and they've got maybe much smaller size gloves you've got to open other items resulting in a lot of waste.

Many participants ($n = 8$) attempted to place their sterile field on a clean hard surface at wound height in order to reduce bacterial contamination.

The exception to this was leg ulcer dressings in which the pack was placed on the floor. This has the potential for considerable contamination from skin scale shed during dressing removal.

The researchers noticed that there appeared to be some confusion arising from the concept of a 'clean' technique, associated with the cleaning of chronic wounds using tap water. This resulted in gross contamination of the sterile field with the washing of the leg being an integral part of some procedures. There is a need to ensure a separation between clean aspects of the procedure and the aseptic procedure itself.

I find that that (the washing) is not an aseptic part it's actually about stripping off the dressing and cleaning.... You should actually have a pack with gloves, a bag and a sterile towel for drying. I would then go on once I've got the leg prepared to open my sterile pack, as I would never use a sterile pack to wash a leg and apply cream.

Discussion

This study has highlighted that some community nurses do not have a fatalistic view about the performance of the aseptic technique in a community setting. However, while staff are aware of the principles of asepsis, contamination of the sterile field and gloves during the procedure is commonplace. To some extent such contamination is attributable to a single nurse technique and this would also occur if a lone nurse was attempting to perform the same procedure in a hospital setting, for example, during wound irrigation. Although the materials and dressing packs play a part in breaking the aseptic procedure, nurse error also contributes to this process.

One of the striking features of this study is the fact that the participants had received no training in the performance of the aseptic technique since their initial nurse training. The majority of participants ($n = 9$) had been educated at a time when the assessment of the aseptic technique was part of the national nursing syllabus (Takahashi, 2002). In particular, practitioners were just expected to develop their own solutions to the problems presented by the performance of the aseptic technique within a community setting. This, together with the fact that some of the features of the aseptic

technique, such as no-touch and the use of forceps, were regarded as 'ingrained', raises concerns about the potential development of idiosyncratic and ritualistic practice. It could be argued that the teaching of the aseptic technique was part of task-focused training, which was reinforced by the socialisation of pre-registration nursing students (Ford and Walsh, 1994; Mackintosh, 2006). One of the most surprising findings from this study was the identification of how the notion of a clean technique and the washing of chronic wounds with tap water had been integrated with the aseptic technique. This appeared to have led to the development of a hybrid technique in which the principles of asepsis were being compromised. This suggests considerable difficulties with the implementation of evidence into practice, particularly in an area in which practice was regarded as ritualistic. The evidence related to the use of tap water was picked up and disseminated to practitioners more quickly than many other types of evidence resulting in such practice becoming widespread (Fernandez *et al.*, 2001). In addition, practitioners appeared to be willing to use the technique because it offered advantages over standard wound cleansing techniques, particularly in relation to the care of the patients' surrounding skin (Young, 1995 and Punder, 1997). However, there was little advice about how the technique should be used alongside an aseptic technique resulting in staff attempting to continue with the principles of asepsis alongside the washing of chronic wounds with non-sterile water. This raises questions about evidence-based practice in terms of the use of evidence and implementation of research findings. Rolfe *et al.* (2003) describe how the implementation of evidence-based practice can be supported by protocols, documentation and audit and clear protocols may have avoided the development of an evidence/ritual hybrid in this case.

This study suggests that further research is required to clarify in which circumstances a clean procedure can be used in preference to an aseptic one or whether, indeed, as the evidence currently seems to suggest, the procedures are in fact interchangeable, given that they result in no increase in infection rates. One thing is clear that wound cleansing with tap water, especially where this involves the washing of chronic leg ulcers, should be regarded as a separate procedure from the application of new wound dressings.

This study raises issues for the manufacturers of dressing packs and wound cleansing solutions. There appears to be a drive to create a standalone procedure pack, which can provide everything the practitioner needs to perform an aseptic procedure. The inclusion of sterile gloves into the pack causes considerable problems for community nursing teams who may have members who have a variety of glove size requirements. In addition, the packs in use do not contain a receptacle for wound cleansing fluids necessitating the use of sterile pods, which breaks the aseptic procedure. Another problem with the way the packs are put together is the inclusion of personal protective equipment, such as an apron, inside the sterile field. Other concerns about the packs are probably less of an issue for the manufacturers and more of an issue for the individuals who determine a Trust's wound care formulary. There appears to be little reference to infection control teams in deciding which procedure pack should be made available via the formulary. It is important that issues related to whether the pack allows staff to follow the principles of asepsis are considered in any decision about which pack should be adopted. In addition, all wound care formularies need to allow for the exceptional use of other packs and materials as circumstances dictate.

This was a small-scale study that involved examining a number of aseptic procedures being performed in a community setting. The sample size and the way in which participants were selected could affect the results, in particular, the findings that staff do not have a fatalistic approach to wound management. Despite the limitations the study raises important questions about the implementation of evidence into practice such as the incorporation of wound cleansing with non-sterile fluids as part of an aseptic technique. Further research work is needed to examine this area of practice to avoid the development of practices that lack an appropriate evidence base and that are peculiar to the individual practitioner.

Conclusion

This project has added to the body of knowledge about the performance of the aseptic technique in a community setting. Although the project has confirmed that many staff are confused about the

principles of asepsis following the introduction of the 'clean' technique and wound cleansing with tap water in the 1990s, the staff are still aware of the principles of asepsis. The community nurses in this study had developed solutions to performing the technique in a community setting. Although many of these solutions demonstrated adherence to the principles of asepsis, there was a risk that practice could become idiosyncratic in nature. Such problems could be avoided through regular staff training, policies and through the use of reflection to review practice.

To some extent poor adherence to asepsis has more to do with a lack of assessment and poor materials than a fatalistic view that it is not possible to perform a truly aseptic procedure in a home environment. This study suggests that some simple yet effective changes in practice could improve adherence to the principles of asepsis in a community setting. In addition, it suggests that greater care needs to be taken when considering how research findings should be implemented in practice.

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